December 17, 1960

VOL. 78, NO. 25 PAGES 401-416

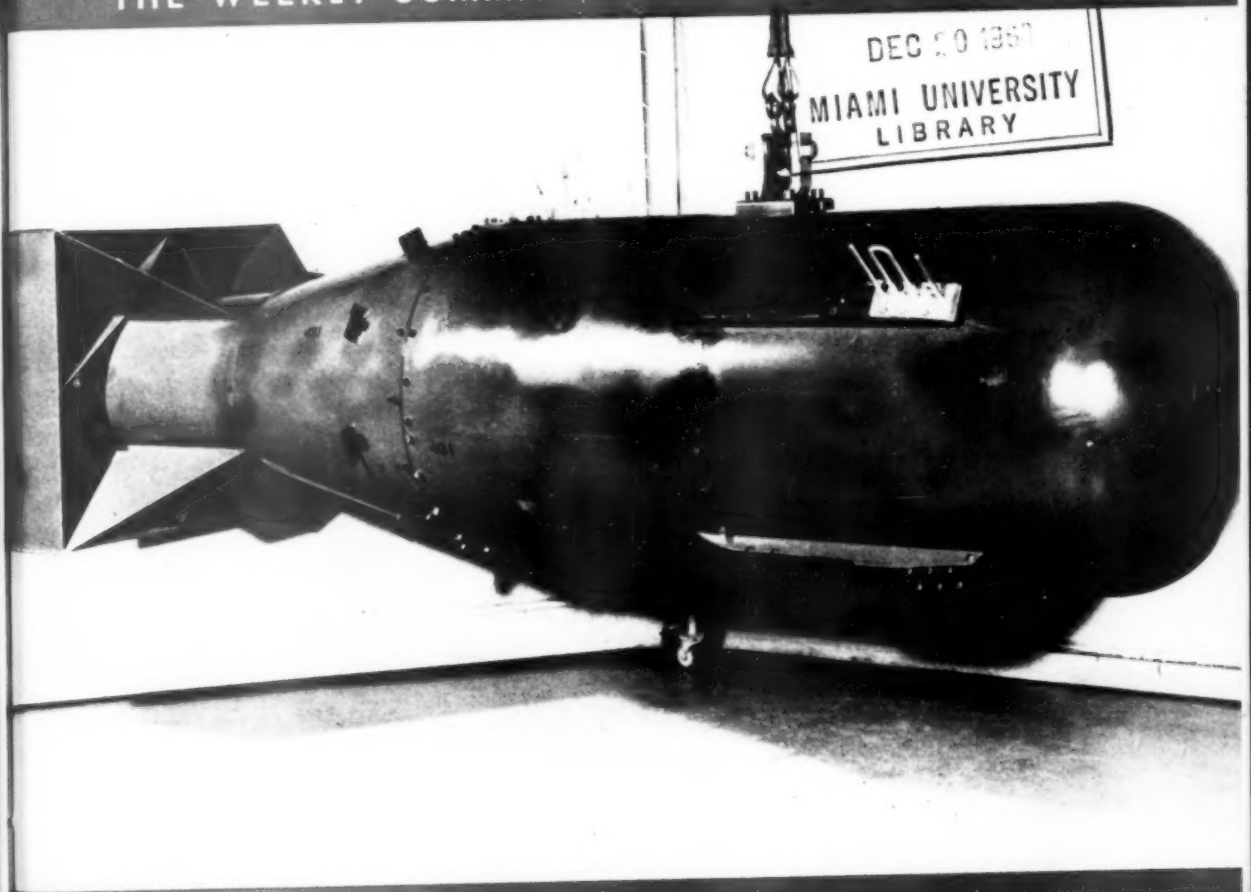
15¢

$5.00 A YEAR

SCIENCE NEWS LETTER

In This Issue—SCIENCE REVIEW OF THE YEAR

THE WEEKLY SUMMARY OF CURRENT SCIENCE



"Little Boy" Bomb

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A SCIENCE SERVICE PUBLICATION

MEDICINE

Uterine Cancer Curable

➤ CANCER OF THE UTERUS will be 100% curable, Dr. Emerson Day, director of the Strang Cancer Prevention Clinic, New York, predicted at the clinical meeting of the American Medical Association in Washington, D. C.

He reported that there had been no deaths following removal of uterine cancer from 12 patients after a period of five years or more following surgery.

Dr. Day reported on a sampling of 60 cases among 21,156 men and women examined since 1954.

The three major locations for operable cancer are the colon-rectum, the breast and the uterus, he said. Of 25 cases of colon-rectum cancer removed, 22 of the patients were free of the disease five or more years later. Of 23 patients who had breast cancer removed, 20 were alive and without evidence of the disease five or more years later.

Dr. Day said there is a stage at which every tumor that arises "from a primary focus" is localized at the site of its origin, and that for most sites the cancer is removable and curable.

Shortcomings in cancer detection are largely responsible for fatalities, he reported. Variations and diffusion of cancer control programs throughout the United States are reasons for ineffectiveness.

Dr. Maurice Fremont-Smith of Massachusetts General Hospital, Boston, said that a vaginal smear is necessary to detect cancer of the uterus. Just seeing the tumor is not enough.

To justify hysterectomy, or removal of the uterus for cancer, he said, not only should there be a positive smear but a positive biopsy, diagnosis of tissue under microscope.

Of 436 women with negative smears followed for two to 15 years, only two were positive later on.

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SURGERY

Surgery in Liver Patients

➤ RESULTS OF SURGERY in patients with cirrhosis of the liver can be diagnosed with a new technique developed by Drs. Donald G. Mulder and John F. Murray of the University of California Medical School in Los Angeles.

The technique involves obtaining multiple blood samples from the vessels that take blood to and from the liver. Small amounts of injected fluorescent dyes and other chemicals can thus be traced through the complex liver circulatory system.

In cirrhosis of the liver, there is blockage within the liver of the portal vein, which normally carries blood from the intestine to the liver. The pressure in this vein becomes very high so that severe bleeding may occur, usually into the esophagus and stomach.

The surgical treatment of this condition involves making an opening between the portal vein and the large vein (inferior vena cava) that drains blood from the lower body and is not involved in the disease process. The vessels are joined side to side, allowing blood to flow freely out of the portal vein and thus lowering the pressure.

Some authorities have questioned whether diverting blood away from the liver by such an operation might be detrimental to liver function.

Using the new technique, the UCLA investigators were able to demonstrate that this type of surgery was beneficial. The patient is protected from further hemorrhage by lowering the pressure in the portal vein and in the liver. In addition, the changes in liver circulation following the operation are not harmful, and the nourishment of the liver may even be improved.

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PUBLIC SAFETY

Heavy Shield Unnecessary

➤ HEAVY SHIELDING as protection for an astronaut against space radiations may not be necessary, at least for trips of less than 50 hours and at distances not greater than 618 miles from earth, the Air Force School of Aviation Medicine at Brooks Air Force Base, Texas, has announced.

Lightweight aluminum provides acceptable shielding, and, in fact, heavy shielding, such as lead or gold, would be more harmful than no shielding at all, Dr. George W. Crawford, nuclear physicist of the school's department of radiobiology, reported. (Other recent reports show that living organisms are killed at a height of 1,180 miles.)

His findings were based on examination of the biological specimens encased in a three-pound aluminum capsule as part of the payload of Discoverer XVII satellite launched in November. The specimens, including human eye and bone tissue, bacterial spores and algae, spent 50 hours in orbit during a gigantic solar flare. The satellite whirled about the earth 31 times before it was returned and recovered in the earth's atmosphere in the air near Hawaii by a USAF C-119 aircraft.

Previous estimates by scientists of radiation levels had indicated that solar flares might be of such intensity as to deliver a lethal dose to astronauts unless protected by heavy shielding.

"Our specimens received not more than 32 to 35 rads during the 50 hours they were in space," Dr. Crawford said. "They were in space during one of the largest solar flares ever recorded and were exposed to radiation from the flare for 50 hours starting just seven hours after the flare began."

This is the first time specimens from this country were exposed to such intensities and concentration of radiation for an extended time at such an altitude and recovered for analysis.

The biological specimens were encased in different types of metal to test their effectiveness as shielding materials. Some specimens were shielded only by the thin aluminum covering of the specimen capsule and the comparatively thin shell of the recovery capsule. Radiation dosimeters showed that aluminum provided better shielding properties than lead and that any heavy metal such as gold or lead becomes a hazard during a solar flare as high energy protons interact with these heavy metals to create damaging X-rays, Dr. Crawford explained. This does not occur with the lighter metals or plastics.

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DECORATES THE TREE—Christmas tree decorating with the master-slave manipulators (what the master does the slave does) gives practice to operators who will work with high-level radioactive materials in the new radiochemistry cells at the Atomic Energy Commission Laboratories at Hanford, Wash., operated by General Electric Company.

ASTRONAUTICS

Set New Law Principle

When no nation asked permission to send up satellites and no protests were made, a new law principle was established. Space legislation is now needed, Tove Neville reports.

➤ A NEW PRINCIPLE of international law was established when satellites were sent into space without permission from other nations.

No permission was sought by any nation, none was given and no protests were made about the launchings. Such lack of action proves the new principle, Paul G. Dembling, assistant general counsel to the National Aeronautics and Space Administration, told the American Rocket Society meeting in Washington, D. C.

He said no action has yet been taken to define territorial rights in space, but no legal authority believes that territorial rights should apply to space, not even in Russia.

The main question to be answered is: where does air space end and outer space begin. Three types of proposals have been made:

1. Geophysical limit, which would set the troposphere, the ionosphere or similar division, as the limit.

2. Arbitrary limit, set at a certain altitude.

3. Air-breathing limit, above which aircraft requiring atmosphere cannot fly.

Mr. Dembling said that the law must consider socio-economic as well as the physical problems of space flight.

The legal principles regarding liability for damage from space vehicles of any kind are quite well set already, he said. Responsibility for damage, direct or indirect, would fall on the launching nation. Indirect damage from radioactivity would be included under this classification.

Concerning commercial exploitation of space, an entirely new legal field will be opened, Mr. Dembling said. If commercial firms can launch their own satellites, licensing laws must be made. The rates they can charge for their services must be considered. Provisions for national and international control of such use of space must be made.

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ASTRONAUTICS

"See" Earth Three Ways

➤ THE FIRST ASTRONAUT will have three ways of "looking" at the earth as he orbits around it one hundred miles up. Besides direct vision, he will have a periscope and instruments to "see" by.

The astronaut will be able to see only an edge of the earth and black space beyond it when he looks through the window in front of his head.

He will not be able to see the whole earth at any time, but will have a periscope between his knees that shows him a view of the earth beneath him as a circle the size of a grapefruit. This will represent an area 1,800 miles in diameter from horizon to horizon at this altitude, Dr. Robert Voas of the Space Task Group, National Aeronautics and Space Administration, Langley Field, Va., reported.

Dr. Voas described to the American Rocket Society meeting in Washington, D. C., four tasks the astronaut must face in trying to control his Mercury space capsule.

When the capsule separates from the rocket, it is possible that the capsule will tumble, turning end over end. The astronaut has to stop this motion with his instruments and reorient the capsule so it is level with the earth. Next he has to set his gyros so the capsule remains level, without tumbling as it will have a tendency to do. He also has to keep it from oscillating and, lastly, he must be able to fire retrorockets and change the orbit of the capsule to bring it back to earth.

Dr. Voas said that the astronaut has a number of different systems by which he can carry out his tasks. First of all, he has an automatic pilot that, however, will allow the capsule to move only in the forward direction, with the man aboard flying backwards.

If the astronaut wants to fly forward, or any other way, he must use one of his three manual control systems. These systems have different engineering characteristics, Dr. Voas said.

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Astronauts Man Controls

➤ THE ASTRONAUTS have learned to work the controls in the Mercury space capsule while tested in a centrifuge trainer that simulates the conditions under acceleration up to 8 g's, or eight times the earth's gravitational pull. This force will be experienced by the astronaut from rocket propulsion when leaving and returning to earth.

Dr. Robert Voas of the National Aeronautics and Space Administration, Langley Field, Va., reported to the American Rocket Society meeting in Washington, D. C., that the astronauts were trained in two different types of trainers. One type is fixed and a computer comes up with problems for the astronaut who then has to respond as he would when actually in space.

The other type of trainers move. One is a platform on air bearings. The astronaut controls the platform while it moves. Another moving trainer simulator tumbles on a gimble apparatus. In this the astronauts were turned over and over 50 times per minute, and all were taught to handle controls while moving at this speed.

A third moving trainer is the centrifuge simulator, in which it is very difficult to handle controls, Dr. Voas said. The astronauts are now fully trained to go into space, but they will continue the program until the launch, he said.

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New Rocket Nozzle

➤ MISSILES WILL be lighter and shorter when a new reverse-flow type rocket nozzle

ASTRONAUT COOPER INSIDE THE CENTRIFUGE TRAINER.

is put to use, R. S. Kramer reported for Rocketdyne, a division of North American Aviation, Inc., Canoga Park, Calif., which is producing the nozzle.

Detailed information on this nozzle is still classified, Mr. Kramer said at the American Rocket Society meeting in Washington, D. C. He said that the trend in rocket nozzles has been toward shorter design, going from the bell-shaped nozzles, now used in all missiles, to the spike type, to a combination of the two.

The reverse-flow type will use a new idea in rocket nozzles and will likely be adopted for missiles in the future, he said.

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Rocket Fuel at Half Price

➤ THE LIQUID rocket fuel, hydrazine, can now be produced for less than half the present price.

Aerojet-General Corporation, Azusa, Calif., reported at the American Rocket Society meeting in Washington, D. C., that a nuclear reactor can produce hydrazine from ammonia at about 25¢ per pound. This process is being developed for the U. S. Air Force Air Materiel Command.

Uranium-235, suspended in ammonia, is used for the hydrazine production reactor. Fission fragments of uranium break up ammonia molecules, some of which recombine to form stable hydrazine.

Circulation is continuous with the stream becoming subcritical as it leaves the reactor. A yield of one molecule of hydrazine per 100 electron volts will produce an economical plant.

Experiments have exceeded this yield. Ammonia, hydrazine and uranium are drawn out of the reactor stream. A cyclone separator removes the uranium-235 and feeds it back into the reactor. Hydrazine and ammonia are drawn off for additional processing, and then separated. Fission fragments are removed and the ammonia is fed back into the reactor. The hydrazine is further decontaminated and stored.

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Improve Rocket Thrust

➤ A NEW PRINCIPLE can improve rocket thrust to make it as effective as nuclear fuels would without actually using nuclear fuel.

Donald J. Simkin of Ordtech Corp., Walnut Creek, Calif., chairman of a closed meeting on hybrid rockets at the American Rocket Society in Washington, D. C., told SCIENCE SERVICE that this principle can be applied to any chemical or nuclear engines used in rockets for rocket thrust. Details of the principle, worked out by scientists at Astropower, Inc., Long Beach, Calif, a subsidiary of Douglas Aircraft Corporation, are still secret, he said.

The principle, called HIFOX, will lead to expansion of thermo-dynamic barriers, or improve existing performance limits of rocket engines, when applied.

Mr. Simkin explained that the HIFOX principle operates between nuclear specific impulse (pounds of thrust per pound of propellant per unit time) and the chemical specific impulse.

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MILITARY SCIENCE

Pictures of "Little Boy" Released After 15 Years

See Front Cover

➤ PICTURES of the "little boy" atomic bomb dropped on Hiroshima, Japan, in 1945, and the "fat man" type bomb, detonated over Nagasaki, Japan, have now been released by the Department of Defense.

The "little boy" type bomb, seen on the cover of this week's SCIENCE NEWS LETTER, is 26 inches in diameter and 120 inches long. The first nuclear weapon ever detonated, it weighed about 9,000 pounds and had a yield equivalent to 20,000 tons of high explosives. The "fat man" type bomb is 60 inches in diameter and 128 inches long.

• Science News Letter, 78:404 December 17, 1960

SCIENCE NEWS LETTER

VOL. 78 DECEMBER 17, 1960 NO. 25

Edited by WATSON DAVIS

The Weekly Summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington 6, D. C., NOrth 7-2255. Cable Address: SCIENSERVC.

Subscription rates: 1 yr., $5.50; 2 yrs., $10.00; 3 yrs., $14.50; ten or more copies in one package to one address, 7½ cents per copy per week; single copy, 15 cents, more than six months old, 25 cents. No charge for foreign postage.

Change of address: Three weeks notice is required. When ordering a change please state exactly how magazine is addressed. Your new address should include postal zone number if you have one.

Printed in U.S.A. Second class postage paid at Washington, D. C. Established in mimeograph form March 13, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Reader's Guide to Periodical Literature, Abridged Guide, and the Engineering Index. Member Audit Bureau of Circulation.

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GENERAL SCIENCE

1960 Science Review

Parts of satellites recovered in mid-air, galaxies six billion light years away photographed and advances in studies of photosynthesis were main achievements of the year.

This summary is limited by space to highlights, and credit to investigators and institutions is necessarily omitted. Most of the events are described in detail in the pages of SCIENCE NEWS LETTER *for the current year. If you wish to refer to any particular report, you may find it readily through the index. (See SNL, June 25, and also the issue dated Dec. 31.) If you want more information about any item in the summary, send 25 cents to help cover answering costs for each item upon which more information is requested.*

When 1960 progress in science and technology is evaluated in the future, the top advances judged most important are likely to include:

1. Parts of satellites, sufficiently large to carry an orbiting man, successfully snatched from the air and recovered, a first step to space travel.

2. Galaxies in collision six billion light years away photographed.

3. Synthesis of chlorophyll and discovery of early steps in photosynthesis, which may prove to be keys to capturing solar energy artificially and efficiently.

Tested by the hindsight of time, these may be less important than other research achievements hidden in the maze of onrushing scientific publication.

Popular imagination continued to be intrigued by escape from the earth, perhaps as an escape from what is happening on earth. The exploration of space by physical means launched by missiles from the earth is financed because of the military aspects of the dropping of hydrogen bombs accurately on distant places on the earth's surface.

Scientists are heavily engaged in the defense angles, but they are perhaps primarily interested in finding out what does exist in space, on the moon and other planets, and even outside the solar system.

The human astronauts continued in training during the year and eventually some of them will undoubtedly be rocket-borne upon journeys into orbits where humans hitherto have only dared to take imagined trips.

But meanwhile extremely advanced instruments, of small size and extreme capability, are going into space, bringing back information about radiations in space and watching the surface of the earth for predicting such events as weather.

The contribution of satellites to weather prediction and understanding eventually may be worth all the money spent on the missile program, but meteorological investigations would hardly have been financed so adequately if forecasting what the Russians might do were not in the picture.

From the standpoint of the future of humanity on earth, methods of capturing radiation from the sun, practically the sole source of energy available to the earth, is an extremely important research objective. On the basis of the amount of research, time and developmental money spent, the attempt to understand and duplicate photosynthesis artificially or synthetically is practically infinitesimal compared with what is being spent on atomic energy or space research. Not enough is known yet to make sure of the eventual solution of this problem.

Research is going on. During the year chlorophyll was synthesized both in the United States and Germany and the ways in which simple plant life convert carbon dioxide to food became better understood. These may bring important advances in the future.

Beating the green leaf to its own game, like curing cancer upon which great resources are being spent, is a long shot which we can only hope will pay off.

The complexities of the human organism, including the basic processes of thought and brain action, received continued investigation during the year. One achievement was the picking up of brain waves from single nerve cells. Studies of the fundamental factors in living matter, particularly the complexities of the mechanisms of heredity and the chemical factors involved, are likely to have their influence upon studies of diseased as well as healthy living organisms.

When living processes, whether in plants, animals, or lesser organisms, are better understood, it will probably be found that processes of photosynthesis are closely related to the physiology of thought and processes of disease.

Under man's drive to discover facts wherever they originate without regard to where they are likely to lead, which is the process of basic research, seemingly unrelated problems may find solutions.

Archaeologists Dig Into Past

People are interested in how the extremely complex population of this world arose and why human beings are the way they are. Archaeologists and anthropologists during the year continued to dig into the past. An outstanding discovery, the skeletons of three Neanderthals underneath the floor of an Iraq cave, provided new knowledge of the evolution of this forerunner of present-day man.

All over the world, governments and scientific institutions alike are rediscovering the past, using new devices such as the application of an electric resistivity instrument, primarily used by highway engineers, for locating buried archaeological remains. In Egypt a joint effort is under way under UNESCO direction to save the ancient archaeological treasures menaced by the waters backed up behind the Aswan Dams.

Although poultry raisers will not be able to produce it, a cross between the

CHURK—This unimpressive looking bird is really most unusual. He is the result of a history-making cross between a chicken and a turkey—the first known case where two families of birds have been hybridized successfully.

turkey and the chicken, called the churk, was obtained. This is the first true hybrid between two families of birds. While it cannot reproduce itself, it will help scientists understand the biological facts upon which advances are based.

Amplifying light beams by a new way promises to open a new method of communication. The optical maser was developed during the year. The light impulses generated and amplified promise to be more effective in television, astronomy, and medical diagnosis by X-ray fluoroscopy.

Another achievement in physics and chemistry was the production of the highest magnetic fields known, concentrating 14,000,000 gauss in a cubic inch volume.

The control of polio, which has been accomplished in the last few years, was augmented with the approval for use upon human beings of the Sabin live vaccine given by mouth. Because polio is a virus disease, this makes us confident that some of the other virus diseases, perhaps even the common cold which we still cannot control, will be an eventual conquest of medical research.

Conquest of the Air

The conquest of the air, as distinct from outer space, progresses from both a research and a transportation standpoint. Airlines are consolidating their leap forward into the jet age. They are paying for the expensive craft that they are using to greatly reduce the time of getting from place to place over long distances. The first attempts at super speeds with experimental planes are being made. The X-15, the nation's top experimental airplane, had a new and the world's most powerful airplane engine installed, but its maximum capabilities have so far not been tested.

A balloon rose to 115,000 feet carrying photographic plates to record cosmic rays at that high altitude. Engineers look forward to speeds, some years in the future, of as much as 17,000 miles per hour, or 25 times the speed of sound. During 1960 new wind tunnel and aeronautical test devices such as hypersonic wind tunnels were actually in operation up to 15 times the speed of sound at temperatures of 2,000 degrees Fahrenheit for testing airplane models.

There is great interest in the possibility of mankind not being alone in the universe. Are there other worlds? Are other beings, inhabitants of planets of other sun-stars, evolved to such a state that they may be trying to signal us by radio? On this very remote possibility, some of the listening time of the new large radio telescope in West Virginia is being invested trying to detect methodical signals from outer space.

For people on earth there is concern that there may in the future be too many of them for the food supply to support. The population explosion is real. Birth control, while opposed by religious groups, is the subject of research. In 1960, a synthetic steroid came into use, therapeutically upon prescription, that may be a practical contraceptive and an approach to eventual population control.

AERONAUTICS

Tracks of Cosmic Rays Recorded at 115,000 Feet

A giant Skyhook balloon, 400 feet high when inflated, was launched from the airplane carrier Valley Forge and carried 750 pounds of emulsion plates to an altitude of 115,000 feet; the plates, with tracks of high-altitude cosmic rays, were successfully recoverd.

The experimental plane, the X-15, was flown at 1,700 miles per hour at an altitude of 136,500 feet and on another occasion at 2,150 miles per hour at an altitude of 66,000 feet.

Capt. Joseph Kittinger Jr. reached an altitude of 102,800 feet in an open gondola balloon and parachuted to earth from 19½ miles up, reaching 614 miles per hour during free fall.

A height-surveying radar to show the altitude of planes approaching a landing field was installed experimentally.

A system involving the use of red and white lights to guide a private pilot in on the correct path for a safe touchdown was tested; if the pilot is too high he sees only the white lights, if too low he sees only the red ones.

A new low-cost continuous flow hypersonic wind tunnel made possible speeds of Mach 15 and higher and a temperature of 2,000 degrees Fahrenheit for testing airplane models.

An unmanned plane that can make surveys of enemy territory and relay photographic, radar and infrared data day or night under all weather conditions was made public by the Army.

Man may some day be able to fly by flapping a set of artificial wings, it was predicted.

Microphones as tiny as a letter of the type used in most newspaper want ads were built to study the great roars of jet aircraft and rockets.

The "ultimate airplane" was foreseen by an aircraft engineer as being 170 feet long with a wingspan of nearly 99 feet and capable of a speed of 17,000 miles an hour, 25 times the speed of sound.

An Army research airplane was demonstrated that replaced conventional engine-driven propellers with wingtip fans enclosed in shells like a sawed-off, open-ended barrel that can be tilted at any angle between straight up and straight ahead for vertical or forward flight.

ANTHROPOLOGY AND ARCHAEOLOGY

Three More Neanderthals Found in Iraq Cave

Discovery of three new Neanderthal skeletons at depths of 14 to 27 feet under a cave floor in Iraq and comparison with each other and with three others found in 1957 at the same levels promise to provide new knowledge of the evolution of this forerunner of man.

The skull of the 12,000,000-year-old man-like creature *Oreopithecus bambolii* was pieced together and its cranial capacity found to be between 276 and 529 cubic centimeters—within the range of variation of the orang-utang and chimpanzee.

Alacaluf Indians living off the tip of the mainland of South America were found to have higher resting metabolism and body temperatures than white persons and to better withstand low environmental temperatures.

The children of broad-chested parents were found to grow faster and mature earlier than children of narrow-chested parents.

A very ancient jaw bone from Africa, for many years believed to be human because it has what appears to be a chin, was found instead to have a bony growth caused by a bone cancer.

That man lived in South America as much as 10,000 years ago was indicated by the find of stone tools and other man-made objects estimated to be that old.

Many governments and public and private institutions joined in a campaign of UNESCO to save ancient archaeological treasures of Egypt from the menacing waters backing up behind the Aswan Dams.

A new method was developed for determining the age of ancient obsidian objects by measuring the thickness of the surface layer in which moisture had been absorbed.

The michimho, an electronic earth resistivity instrument generally used by highway engineers for determining subsoil conditions, was successfully employed to locate buried archaeological remains.

Remains were found of a big ancient city which extended for more than eight miles along the Porali River in western Pakistan and in which the only buildings were temples and other places of worship.

Remains of an early Phoenician colony were found buried under the ruins of a monumental Roman city at Leptis Magna on the northern coast of Africa.

Study of a 3,000-year-old silver cup from the island of Cyprus provided evidence that decoration of the cup was an inlay of niello, ancient Siamese technique, although some archaeologists hold that it is copper inlay.

Valuable archaeological sites in the path of freeway building operations were saved by a cooperative program between the University of California at Los Angeles, the California Division of Highways and the Division of Beaches and Parks.

A cargo of bronze implements and ox-hide-shaped copper ingots were salvaged from a ship sunk in 1450 B.C. on its way from Cyprus to Turkey.

A diesel powered ship specially designed for underwater archaeological exploration took a party of skin divers and archaeologists to Israel to search King Herod's sunken harbor of Caesarea and the Sea of Galilee for archaeological objects.

A 2,600-year-old wine-making plant, probably the oldest in the world, with storage space for a total of 30,000 gallons of wine, was found near the famous well of Gibeon, Palestine.

A marble statue with feet missing which has been on display for years in this country unidentified was identified as a copy of the Victory statue which once stood poised on the hand of the giant statue of the goddess Athena in the Greek Parthenon.

A series of prehispanic paintings numbering several hundred were discovered in a pueblo excavation near Los Lunas, New Mexico.

ASTRONOMY

Two Galaxies in Collision In Telescope Photograph

The most distant identifiable celestial object, believed to be a galaxy or a pair of galaxies in collision six billion light years away, was photographed with the 200-inch Hale telescope.

New studies of Cepheid variable stars, used as distance indicators, were reported to give corrections for changes in color due to age or intervening dust clouds, thus allowing more accurate distance determination.

A new method for finding the ages and distances of stars, which depends on precise measurements of a star's radiation within certain narrow, especially selected regions of the rainbow-hued spectrum of light, was reported.

Good chances of eventually achieving positive results from the program, undertaken at the National Radio Observatory, to detect radio signals from intelligent life on planets orbiting stars near the sun were foreseen by many astron-

omers, and a universal decoding scheme for revealing possible messages in such radio waves was developed.

A radar signal was sent to the sun's outer corona and back in 17 minutes, marking man's first direct contact with the sun.

The first X-ray photograph of the sun, showing it ringed by a bright X-ray halo, was taken from an Aerobee-Hi rocket carrying a specially designed camera more than 130 miles above the earth's surface.

The absolute positions of eight strong sources of radio waves broadcasting in the heavens were established, and accurate positions of a dozen discrete radio sources were determined.

The methods of measuring apparent brightness of stars now used to determine distances to galaxies far beyond the Milky Way are incorrect, it was reported.

The brightness of newly formed stars differs from one region of the universe to another, an astronomer reported, contrary to the accepted assumption of uniformity.

The first clear photograph of the white gaseous dots contained in sunspots was made by Stratoscope I, a 12-inch balloon-borne telescope flown high above the earth's surface.

Discovery of the dimmest white dwarf star known to man was reported.

Radio waves from Saturn, detected for the first time, showed the planet's atmospheric temperature is 283 degrees below zero Fahrenheit.

The high amount of lithium on earth compared to the sun was reported as supporting the theory that the earth and other planets were formed by condensation of material once a part of the sun.

U. S. plans for observing the moon, planets, sun and the entire universe from an earth-circling satellite carrying a telescope were announced.

Nine new sources of radio waves from outer space have been identified, bringing the total number of extra-galactic radio sources to 14.

Newton's theory of gravitation, used to predict the motions of planets, proved still valid when a suggestion that the theory was in error was shown to be wrong.

It was estimated that one grain of a neutron star, believed to be the leftover core of an exploded supernova, weighs more than 100 billion grams a cubic centimeter.

A fifth very short-period variable star, with a period of three hours, was discovered.

The Kitt Peak National Observatory was dedicated and first observations made with the 36-inch telescope; the glass for the 84-inch is being ground.

A new source of radio waves, the elliptical galaxy M-84 in the Virgo cluster of galaxies, was found to be about a thirtieth the size of the famous source Virgo A.

The planet Jupiter is sending out radio waves showing the explosion causing them is the earthly equal of a 100-megaton hydrogen bomb exploded every second, it was reported.

Oxides of nitrogen poison the atmosphere of Mars, making any kind of life there unlikely, it was reported.

Nitrogen tetroxide was discovered in the atmosphere of Venus, and the water vapor below the cloud level there was found more abundant than previously thought.

Mars and Venus were reported to have substantial radiation belts, as the earth does, and the dust particles of interplanetary space were observed in the atmospheres of the two planets; the Martian satellite Phobos was suggested as an ideal platform for observing the planet.

Nuclear reactions caused by galaxies in collision not visible with present optical telescopes could be detected from satellites, it was reported.

It was suggested that a newly photographed chain of five galaxies, believed to be physically connected, represents a transient stage in the formation or evolution of small groups of galaxies.

A simple type of interferometer—an instrument that can measure the diameter of stars, record the time they pass overhead and also check aberrations of the telescope—was developed.

A new class of meteor showers, older than those already known, were found on photographic plates.

Large radio telescopes in advanced construction stages included a 1,000-foot one in Puerto Rico, a 600-foot one in Illinois, and a 142-foot one in Scotland.

An extremely severe radio blackout and large radio noise outbursts that occurred without solar flares generally associated with these disturbances were under intensive study.

The probable existence of many undiscovered stars near the sun, belonging to the Hyades and Sirius stellar groups, was reported.

A table showing the number of "shooting stars" a trained observer can expect to see any night of the year was issued, based on observations over a 58-year period.

BIOLOGICAL SCIENCES

"Churk" First Cross Between Bird Families

Scientists crossed a Cornish chicken and a turkey to produce a "churk," the first true hybrid between two families of birds.

Chlorophyll was synthesized by two independent research groups, one in the U. S. and the other in Germany.

The 330,000,000-year-old stone remains of a fossilized liverwort, one of the world's most common plants, indicated that life on earth may have existed longer than previously thought.

OPTICAL MASER—A synthetic ruby crystal is the vital heart of this new device for greatly amplifying light beams. The optical maser provides scientists with a powerful, sharply defined light beam with important applications in astronomy, space communication and medical diagnosis.

Ninety dead seals entombed for 2,600 years in the ice of Taylor Ravine in the Antarctic were detected by aerial survey photograph and two perfectly preserved specimens were brought to the U. S. for study.

A pregnant female bramble shark containing 114 embryos, each about 10 inches long, was found off the Hawaiian Islands; this five-gallon mass of embryos is believed to be a record.

A revolutionary genetic discovery was made when it was found that the cortex, or outer jacket of the one-celled animal paramecium influences the looks of offspring, thus indicating that inherited characteristics are controlled not only by the genes and the contents of a cell's nucleus and cytoplasm, but also by the structural organization of the cell itself.

For the first time, the exact spot affected by a mutation, or change in heredity, has been pinpointed; the discovery was made in the tobacco mosaic virus.

Hereditary mutations were identified as tiny loops in molecules of DNA, deoxyribonucleic acid.

A blue-green plant of the genus *Echeveria*, discovered growing on Inca ruins in Peru, was found to have 520 chromosomes, more than any other flowering species known.

A dog food containing flea-killing chemicals was developed.

Zoologists are setting up a resident research station on the Galapagos Islands to halt exploitation and prevent extinction of the famous native tortoise that gave Charles Darwin a major insight for "The Origin of Species."

The first known living fluorescent corals were found at depths below 100 feet on South Pacific reefs off the coast of New Caledonia.

Studies show that houseflies have an adaptable enzyme system that changes from one generation to another and aids these pests in developing resistance to insecticides.

Russian scientists succeeded in freezing birch and black currant twigs to minus 423 degrees Fahrenheit and making them grow afterwards.

A 1,200-square-mile scallop bed, the largest known in the world, was discovered along Florida's east coast.

A prairie-dwelling grasshopper, *Paratylotropidia brunneri* Scudder, was found to communicate over fairly long distances by producing an audible sound with the mouth, the first insect known to have this ability.

A virus disease of beans, thought to be the same as one that caused serious crop loss in Holland, was identified in the U. S.

Water temperature was found to be an important factor in sex determination of the sea urchin; warm water generally produces more male sea urchins and cold water, more females; in water masses subject to wide temperature fluctuations, relatively large numbers of bisexual specimens are found.

The cinnabar moth was imported from Europe and Great Britain to feed on tansy ragwort, a weed that is toxic to horses and cattle.

Vesicular exanthema, a serious viral swine disease that was once a nationwide threat, was reported completely eradicated in the U. S.

Investigators found that Savannah sparrows have a type of built-in, salt-to-fresh-water converter that allows them to ingest sea water containing nearly two percent of body weight of salt per day with no apparent harm.

For the first time, the U. S. Department of the Interior declared an open season on lesser sandhill cranes, to take place in the eastern tier of counties in New Mexico during January, 1961.

Two co-enzymes known as diphosphopyridine nucleotide, DPN, and triphosphopyridine nucleotide, TPN, help reduce carbon dioxide to food in purple bacteria, which contain a special type of chlorophyll.

Experiments with purple bacteria indicated that the first step in photosynthesis is electronic —the separation of an electron and a hole in a chlorophyll semiconductor.

Some weakly active plant growth substances cause plants to produce flowers of the opposite sex.

Cultivated sugarbeets and related wild species were crossed to produce a variety that is resistant to the sugarbeet nematode, an extremely destructive tiny worm.

Forest trees join themselves together through natural root grafts to form an altruistic "tree society," while still competing for the available nutrient supply, it was reported.

A natural antibiotic in plants that helps defend them against fungus attack was isolated.

Russian scientists discovered that the earth's magnetic field exerts a definite effect on growth processes in plants, growth being greatest when roots are oriented toward the south magnetic pole.

A Federal humane slaughter law became effective Aug. 30, 1960; it requires packers selling meat to the Government to immobilize animals before slaughter by using carbon dioxide, electric shock or mechanical concussion.

CHEMISTRY AND PHYSICS

Einstein's Principle Of Equivalence Proved

Einstein's principle of equivalence, a basic assumption of the general theory of relativity, was proved to be true for electromagnetic waves in experiments using the Mossbauer effect of iron-57; this effect was also found to be a property of zinc-67.

Light pulses were generated by an optical maser, opening a new method of communication, particularly in space; other important applications of masers, which amplify light beams, include projecting television pictures, photographing astronomical objects, and in medical diagnosis by X-rays or fluoroscopy.

Evidence was reported indicating that RNA, ribonucleic acid, is one-stranded and is the mechanism by which genes transmit the information that defines the inherited traits of the cell.

A technique of "unzipping" the two-stranded molecule of DNA was announced, permitting the building of hybrid DNA molecules that work just as well as natural DNA in the cells of bacteria.

The latest impact of chemistry on living matter at the molecular level is the idea of "chemical feedback," which explains how living cells are able to behave purposefully.

The highest magnetic fields known were produced by imploding an initially weak magnetic field to a strength of 14,000,000 gauss in a volume of aproximately one cubic inch.

France became the fourth nation to have nuclear weapons and fired an atomic device in the Sahara Desert in February.

The neutral pi-meson was found to have a lifetime of a quarter of a millionth of a billionth of a second, the shortest lifetime of an elementary particle.

Radiation emitted by a very hot plasma held in a magnetic field goes only in planes almost perpendicular to the magnetic field, not in all directions, a theoretical finding that may reduce the size of power-producing fusion reactors.

A new class of highly active antihistamine drugs, derived from isoindoline, were found.

Sound waves can be used to measure accurately the rates of fast chemical reactions, it was found.

Spin energy resonance techniques were suggested as valuable tools in high energy plasma research aimed at controlling the fusion reactions of the hydrogen bomb for peaceful power.

The biological availability of strontium-90 might be reduced if nuclear explosions were conducted so that the strontium-90 was incorporated in insoluble particles, it was suggested.

Thermoluminescence was reported as being used to date rocks and clay up to 100,000 years old.

The largest and most powerful cosmic ray shower ever observed was recorded, confirming evidence that some cosmic rays come from outside the Milky Way galaxy.

The use of electromagnetic forces in combination with an electric field to make ions follow divergent spiral paths was found to speed up the separation of solutions and suspensions.

The mathematical problem of plotting 24 points on the surface of a globe so that each is as far as possible from all neighboring points was solved.

Solid state ionization chambers made from semiconductors were constructed for the detection of nuclear particles.

The 28 billion volt alternating gradient proton synchrotron at the CERN laboratory in Geneva went into operation.

Brookhaven National Laboratory brought into operation the 33 Bev alternating gradient synchrotron accelerator, to establish a new world's record for speeding up particles.

The radioactive debris from explosions of nuclear weapons was recognized as an important tool for studying the mechanisms and rates of natural processes involving carbon.

A new generator, operating on partly carbonized lignite, produced a gas, similar to "water gas," that was used as a source of chemicals as well as a substitute for natural gas, a significant step toward the commercial utilization of American lignite.

The melting point of technetium was measured for the first time and found to be close to 4,000 degrees Fahrenheit.

A new theory was proposed extending the theory of relativity to account for the structure of elementary particles such as electrons and protons by requiring the assumption that such particles undergo changes in dimensions when moving in an electromagnetic field.

Pure oxygen was used instead of air to oxidize hydrocarbons to other chemicals commercially.

Eleven new experiments to help determine the properties of the neutrino were suggested.

Tests showed that water from a well contaminated with radioactive materials can be purified with standard U. S. Army water purification equipment.

A new high-density super-graphite, a recrystallized product, was developed for use in rocket motor nozzle inserts.

A method of producing very cold neutrons for measuring living objects, such as bacteria, as small as ten-millionths of an inch was suggested.

The use of ethylenediaminetetraacetic acid, or EDTA, was found to speed up the detection and measurement of fallout in milk.

A new standard for the meter 1,650,763.73 times the wavelength of the orange-red spectral line of krypton 86 was adopted.

The first nuclear submarine carrying Polaris ballistic missiles went on maneuvers.

Year-long series of measurements indicated no variation in the frequency of radiowaves radiated by ammonia molecules as the earth moved around the sun, thus confirming Einstein's especial theory more precisely than did previous experiments.

The use of strontium-90 as a long-lasting source of electricity for remote stations was predicted.

A mathematical method was devised for computing the levels of radioactive fallout inside buildings.

Radioactive carbon tests showed that portions of the lignin molecule contain glucose.

A material, polybutadiene, that has the characteristics of both plastics and rubber was developed.

Research showed that neutron and gamma-ray bombardment make some bituminous coal harder.

Strontium-90 content of soils was found to be equal to the cesium-137 content divided by 1.6, thus simplifying the problem of strontium-90 analysis.

Plans were announced to install and operate a portable nuclear reactor on the Greenland Ice Cap.

A new synthetic rubber that is completely nonflammable, highly resistant to attack by gasoline and corrosives, and still soft and resilient at 60 degrees below zero, was developed as one nitroso-fluorocarbon rubber.

Induction-type magnetometers and earth-current stations all over the world measured the geomagnetic disturbances resulting from a 1958 nuclear explosion high in the atmosphere above the southern Atlantic Ocean, it was reported.

A new type of nuclear reactor utilizing fragment recoil energy for chemical reactions was built.

A new nitroso rubber that not only is flameproof but actually extinguishes flame was developed.

The high atmosphere concentration of radioactive strontium-90 was found to be much lower in 1960 compared to 1959, less than 15% of the total world-wide fallout from nuclear explosions remaining in the upper atmosphere.

A new method for bonding plastics to copper oxidation of polyethylene in contact with an oxide film on the metal was developed.

More than five pounds of the man-made element plutonium were placed in a reactor for long-term bombardment by neutrons, to produce the largest quantity of the element californium and pave the way for the preparation of element 103 and other heavier elements.

A new process was developed for producing single crystals of many of the highly refractory metals and some of their compounds; the single crystals can be worked at lower temperatures than are normally possible.

Maleic hydrazide was found to control effectively the growth of hedges and ornamental plants.

A new publication began listing monthly the more than 60,000 chemical compounds reported each year in the scientific journals.

The explosion of hydrogen bombs in the atmosphere interferes with radio reception because the highly ionized region formed by the explosion lasts for several days and greatly increases the atmospheric absorption of radio waves, it was reported.

The first computer-made journal was produced.

A time-of-flight mass spectrometer able to analyze chemical reactions that occur in 1/10,000th of a second was developed.

The second large commercial nuclear power plant in the United States reached full power, producing 180,000 kilowatts of power.

Atoms for Peace Awards were made to Drs. Leo Szilard, Eugene P. Wigner, Walter H. Zinn and Alvin M. Weinberg.

The Nobel Prize in Physics went to Dr. Donald A. Glaser of the University of California in Berkeley for his method of detecting radiation with a bubble chamber.

Prof. Willard F. Libby of the University of California in Los Angeles received the Nobel Prize in Chemistry for his method of dating ancient objects with carbon-14.

A new polypeptide was synthesized with one

third the activity of ACTH, the body's hormone that stimulates the adrenal glands to produce cortisone.

ENGINEERING AND TECHNOLOGY

New Transmitter Sends Simultaneous Broadcasts

A short-wave radio transmitter was developed that can simultaneously broadcast two or more independent transmissions on different wavelengths.

A way of predicting whether a radio station at one point is likely to be heard 500 miles away at another point was developed.

An electronic transmission method, "thin route tropo," underwent final tests; it requires an antenna only four feet wide and eight feet high, reducing transmission costs 60%.

A two-way message system used radio signals reflected from the ionized air left in the wake of meteors.

A diesel engine burning a fuel mixture of half oil and half coal dust successfully developed ten horsepower.

Predictive analysis on the UNIVAC computer showed that the Russian language has a "hitherto unsuspected degree of simplicity, regularity and universality"; this is a step toward automatic machine translation.

A machine that can "understand" ten spoken syllables was built as a step toward production of a typewriter that will type spoken words and factory machines that will work in response to spoken directions.

It was reported theoretically possible to build an electronic computer that would reproduce itself and improve on itself.

The first concrete evidence that substances in plants determine their physiological susceptibility to disease came to light when a globulin-type protein was found in a particular race of flax rust fungus and in susceptible flax plants, but not in resistant flax.

A method was developed for producing instant food powders by whipping liquid food concentrates into a foam, spreading the foam on a belt or tray, drying it and compressing and crushing it into powder form.

The world's largest permanent magnet, weighing 1,720 pounds and measuring 52½ by 36 by 10 inches, was built to help pump liquid sodium in a breeder-type nuclear reactor.

Circulating air in a home oven with an electric fan cooks food faster at a given temperature or makes it possible to cook the food with only 67% of the fuel now required, it was found.

A portable fuel-cell power plant was developed for mass production for the armed services; it has no moving parts, never needs recharging, but produces electricity to power radar systems directly from its fuel, the metal hydride.

A 600,000-word mechanical dictionary was developed for use with a computer in the automatic translation of Russian technical literature at the rate of 360,000 words per hour.

An experimental machine was demonstrated that can be taught to identify correctly the letters of the alphabet after only 15 exposures, and can recognize letters in a type face never "seen" before with 79% accuracy.

An experimental gas turbine-powered hydrofoil ship was developed and skimmed inland waters at up to 50 miles an hour.

To prepare books for the blind, a new method was developed for reproducing braille letters by baking plastic dots onto paper, instead of embossing them in the paper itself; the results are similar to Louis Braille's original method, round-headed nails driven into a plank.

The work of nuclear physicists and meteorologists will be made easier by development of a more advanced solid-state digital computer, the LARC, capable of 250,000 additions or 125,000 multiplications per second, performing as much work in one hour as 40 men working with desk calculators could accomplish in 100 years.

Improvements in microwave tubes made possible new superpower radio frequency sources capable of producing many times more power than conventional types, important in radar detection of long-range missiles.

A black glass was developed that is impervious to virtually all wavelengths of ultraviolet, visible and near-infrared light to which silicon semiconductor crystals are sensitive, simplifying the mass production of electronic devices.

It was found possible to provide arid underdeveloped countries with an easily available and economic source of energy through a network of pools of salted water storing up the heat of the sun.

A security telephone was reported that insures privacy by scrambling the voice in one instrument of a pair and restoring it to normal speech in the companion phone.

A transatlantic telephone cable system went into service that will carry the voices of 36 persons at once over a wire only 13/100ths of an inch thick.

An experimental electric tractor powered by 1,008 fuel cells pulled a multiple-bottom plow through parched, packed earth, pointing to the start of a revolution in powered farm machinery.

An experimental tube, a thermionic energy converter, was made and used to produce electricity directly from the heat of the sun.

A contract was arranged for the building of a small atomic reactor and a small turbine engine for converting the atomic energy into usable mechanical power.

A synthetic jet plane oil was developed that can be stored in tropical areas for five years without deteriorating.

A clinical electronic thermometer that operates on transistors and a small battery was developed and enabled a hospital nurse by flicking a switch to read a patient's temperature from her office.

Silicon solar cells for converting light directly into electricity, which when invented in 1954 had an efficiency of only six percent, now have conversion efficiency of 14%, it was announced.

Metals were shaped and bonded together by a powerful shock wave produced under water by a 20,000-volt discharge between two underwater electrodes.

New alloys of columbium were developed that meet space age and nuclear requirements.

A revolutionary, low-distortion radar system was developed that can observe enemy troops in almost any kind of weather and can produce aerial maps of thousands of square miles of land per hour, night or day, working from either piloted or unmanned aircraft at ground speeds of 200 to 900 miles an hour.

An organic film that contracts when it comes in contact with an acid and expands when it comes in contact with an alkali, thereby lifting small weights, was developed as a crude forerunner of a "muscle engine."

Electronic computers were being taught to communicate with each other, with complete standardization the goal of 24 manufacturers.

Devices to cut down air pollution resulting from automobile exhaust were offered on some 1961 models.

GEOPHYSICS

Chemical Predecessors Of Living Matter Found

Molecules of the chemical predecessors of living matter were found in stony meteorites.

The international cooperation in geophysics will be continued under the guidance of the International Geophysics Committee for the purpose of measuring the world's magnetic field at a quiet interval in the sun's 11-year cycle of activity.

A national center of atmospheric research was established by the National Science Foundation to conduct and stimulate basic research on weather.

Mathematicians finally solved two problems that have baffled scientists for generations—the theoretical determination of ocean tides and the calculation of the earth's resonance frequency.

Geophysical studies indicated that the mantle of earth is as rigid as steel during short periods of time, but can be permanently deformed, like a plastic, by forces affecting it over a multi-million-year span.

Although lack of funds continued to plague the Mohole project to dig through the earth's crust, the program entered a new phase with the selection of a ten-mile-square area off Guadalupe Island as a possible site for drilling experiments.

A new electronic camera was announced that can take a continuous strip of weather pictures of the earth from a satellite, record this on an electrostatic tape and convert this information to television signals for broadcasting to earth-bound receivers.

Hurricane Donna caused damage estimated at more than a billion dollars and loss of more than a hundred lives.

A new way of detecting tornadoes and earthquakes by recording the low-frequency sound waves generated by them was developed.

An automatic surface weather station was operated successfully in the middle of the Gulf of Mexico.

A mile-long rock slide containing from 35,000,000 to 50,000,000 cubic yards of rock occurred in southern Montana killing about 20 people and damming the Madison River and was the result of an earthquake of 7.1 to 7.8 magnitude.

Silicon-32, a radioactive isotope found in marine sponges, showed promise as a means for dating oceanographic phenomena.

A study of the orbits of American satellites showed that the earth's atmosphere flattens at the North and South Poles.

A submerged island about 900 feet below the surface of the ice and about 14,000 square miles in area was discovered about 500 miles north of the tip of Siberia rising approximately 8,100 feet above the ocean bed.

Observations from space satellites will teach man more about the earth in the next few years than he has learned in the preceding thousands of years of study, it was predicted.

By comparing three series of weather records, the U. S. Weather Bureau concluded that large amounts of rain seem to fall on certain dates year after year.

Studies of seasonal and annual temperature means confirmed that the climate of the continental United States has grown warmer since the beginning of the 20th century.

A Russian report said that Sputnik III measured atomic oxygen at altitudes between 135 and 590 miles.

The presence in the air of large amounts of sub-microscopic particles called ice nuclei, which are often associated with widespread rainfall, may be closely connected with air masses that move in from the ocean.

With the hope of someday knowing ahead of time when and where destructive earthquakes will strike, the U. S. Coast and Geodetic Survey made plans to furnish $500,000 worth of seismological equipment to research stations in the U. S. and foreign countries.

Underwater sound waves from depth charges

were detected at a record distance of 12,000 miles, or virtually halfway around the world.

A spectacular pressure rise that occurred during a three-hour period at Yakutat, Alaska, on Dec. 18, 1959, may be the "greatest hourly surface pressure rise" not associated with a tropical storm or hurricane ever found.

A study of earth waves showed that large nuclear explosions cause the earth to vibrate far from the detonation site and that all waves so generated can be easily identified.

The earthquakes that shook Chile this year extended 31 or more miles below the surface of the earth, and the heaviest quake, with a magnitude of 8.25 to 8.5, nearly equaled the 8.9 of the biggest earthquake ever recorded.

The worst magnetic storm in a decade disrupted global communication.

The earth's magnetic field at ground level was found to be affected, with a lag of less than one minute, by changes in electric currents far above the earth where high-speed charged particles, such as those in the Van Allen radiation belts, are trapped.

A fire at Mirny, the Russian scientific station in the Antarctic, took the lives of eight scientists, demolished the meteorology building and destroyed original meteorological records.

The Van Allen belts that surround the earth in space can damage the solar batteries used to power satellite instruments by changing the vital structure of their semiconductors and blackening the quartz windows designed to let in the sun's light.

It was established that the blue haze seen over areas of vegetation on a warm summer day is actually petroleum in the process of formation.

The five degrees Fahrenheit increase in the warmth of the Gulf Stream along the U. S. coast within the last 60 years was reported to be related to an observed increasing strength of the high pressure area known as the Bermuda High.

A 15,980-foot-tall undersea mountain, higher than California's Mt. Whitney, was discovered about 550 miles west of the Cape of Good Hope, South Africa.

The use of radioactive fallout from nuclear bombs to prospect for new sources of drinking water was suggested.

It was announced that a three-inch bronze disc would be erected to mark the exact location of the South Pole as pin-pointed during the International Geophysical Year.

An area in the southeastern Pacific has heat flow through the earth's crust about eight times as fast as the average world rate, it was reported.

The hills and valleys beneath the mud and sand bottom of the Gulf of California were mapped by the use of a gravity meter on board a ship.

A new geyser erupted in a drill hole abandoned for lack of water with a continuous flow of 400 to 600 gallons per minute to heights of 150 to 200 feet near Lakeview, Ore.

The U. S. Weather Bureau prepared a map for the Bureau of Public Roads showing the maximum wind speeds 30 feet above the ground for this country.

Geologists concluded that Sierra Madera in western Texas is the site where an asteroid from outer space exploded as it struck the earth.

The geysers and springs in the Yellowstone National Park underwent changes in temperatures and schedules after the August earthquake but are slowly returning to normal.

A study of the decay of radioactive potassium to argon enabled a geologist to set the age of the Palisades that line 20 miles of the western shore of the Hudson River in New York and New Jersey at about 190,000,000 years.

Seismologists determined that the earthquake that razed most of the Moroccan seaport of Agadir had its epicenter just north of that city, an unusual area for strong earthquakes; damage was far greater than the magnitude of 6.0 or less on the Richter scale would indicate.

"Meadows" of marine grasses and of reefs formed of calcareous seaweeds were discovered along Pacific Central America.

A record lightning flash, consisting of 54 current surges that lasted two seconds, was reported.

Some of America's glaciers are advancing southward and, if the trend continues, could grow to their former tremendous size, it was reported.

MEDICAL SCIENCES

Sabin Live Polio Vaccine O.K.'ed for Manufacture

The U. S. Public Health Service approved the Sabin oral live poliovirus vaccine for manufacture by potential producers.

A precedent-breaking kidney transplant between non-identical twins proved successful through total body irradiation that enabled the patient to accept the foreign tissue.

A new penicillin called Staphcillin proved active against all strains of staphylococci tested and was tolerated by some individuals who are allergic to other penicillins.

Rous sarcoma, a virus-caused cancer found in chickens, was transmitted from bird to bird, providing evidence that a virus-caused cancer can be contagious.

A contraceptive synthetic steroid, to be taken in pill form, was approved by the Food and Drug Administration for prescription sale.

A live artificial vaccine to produce protective antibodies against two specific strains of bacteria, *Salmonella* and *Escherichia coli*, which are highly infectious in children, was reported developed in Germany, where laboratory tests with animals were successful.

A virus found in human cancer produced a new and characteristic disease in laboratory animals without producing any increase in cancer occurrence.

Tissue culture preparations of DNA from polyoma virus produced tumors, leading to the conclusion that the DNA had been instrumental in converting normal to cancerous cells.

A technique for detecting mouth cancer was found effective by dentists after a three-year trial of taking smears or scrapings from the mouth for microscopic examination.

A simplified way was reported to detect cancer of the esophagus by injecting hematoporphyrin, a derivative of hemoglobin, into the blood stream and watching it accumulate in the tumor.

The addition of small amounts of reserpine compounds was found to enhance the action of antifolic compounds used in treating certain types of tumors and leukemia.

A significant decrease in induced mammary cancer was seen in rats that had their ovaries or thyroids removed, and in rats given large amounts of L-thyroxine, an active thyroid hormone.

Lung cancer was linked to arsenic in both coal smoke and cigarette smoke.

A study of precancerous lesions provided a new link between smoking and cancer.

The drug sarcolysin, or chloroethylaminophenylalanine, was demonstrated in Russia to prolong life for cancer patients with a tumor arising from sperm cells.

"Cloud babies," so called because they live in a cloud of bacteria, were found to be an important factor in explosive outbreaks of staphylococcic infection, both in the hospital and, after discharge, at home.

Heat control over the essential chemical of heredity in living cells, deoxyribonucleic acid, or DNA, was demonstrated with temperatures ranging from 185 to 198 degrees Fahrenheit.

Paralyzed leg muscles were made to function again by an experimental electrical device that shocks the muscles and makes them draw up.

A new diuretic, B-37, which differs from amanozine only by the addition of a chlorine atom in the molecule, has been found safe in animal experiments.

A body hormone, aldosterone, produced by the adrenal glands, was found to be 250 times as powerful a heart stimulant as the most effective drugs known.

Levels of radioactivity in milk were reported as safe, with the highest levels of strontium-90 measured in the St. Louis, Mo., area.

A live parasite vaccine made in Great Britain to fight parasitic infections in cattle offered hope for combating hookworm and schistosomiasis in human beings following experimentation now confined to animals.

High blood pressure caused by poor kidney supply was corrected by surgery linking the main aorta and the kidney with synthetic blood vessels.

Cardiac shunts, the dangerous mixing of oxygen-poor blood and oxygenated blood through holes in the heart partition, were successfully detected with a radioactive gas, krypton-85.

Heart block in three unborn babies was diagnosed with an electrocardiograph to help uncover the cause of such defects and permit surgeons to prepare for corrective surgery after delivery.

The amount of testosterone in human blood was measured for the first time by changing the male sex hormone to a female hormone, estradiol, which can be measured because of its larger amount.

A portable "laughing gas" generator was developed for use by medical units under combat conditions.

Completely reshuffled cells, taken from the liver or kidney of chick embryos, reconstructed the same organ without outside direction.

A drug inhaler, Medihaler-Ergotamine, was reported of value to migraine headache sufferers who inhale small but effective doses of ergotamine tartrate.

A living stomach was filmed in color for the first time through a technique of using glass fibers to transmit the light necessary for motion pictures made with highly sensitive film.

A boy was reported to have 69 chromosomes, half again as many as normal.

Coccidioidomycosis of the lungs, a fungus disease resembling tuberculosis, was treated successfully by surgery.

Alkyl benzene sulfonates, the class of detergents most difficult to remove from water, were almost completely removed by passing through Duolite, a plastic-like material A-102D.

A new way to detect amyloidosis, a condition that often precedes or accompanies diseases such as tuberculosis, osteomyelitis, lung abscess or gummatous syphilis, by injecting Evans blue dye into the blood stream, was shown to be successful.

Numorphan, a new synthetic derivative of morphine, was reported to be safer and more effective for use during childbirth than other analgesics.

A new technique made it possible for a patient to view his own X-ray fluoroscope examination and for consultants to see diagnostic images on a television-like screen.

Clots in the blood vessels of animals' lungs were located by X-ray and removed by surgery.

A human kidney was refrigerated and preserved during surgery with a new device operating on the principle of air-to-liquid heat exchange.

Cleft palate was closed and lengthened in a single one-hour operation performed on 22 babies.

Skin storage for burn grafting was demon-

strated in Germany to be safe for as long as five years by using fixed cold temperature procedures.

The pain of burns was lessened and healing speeded by immediate treatment with ice water, continued from 30 minutes to five hours.

Two new thyroid extracts, triapron and tetraiodothyroformic acid, chemically denatured so that they do not stimulate the heart, were used for 40 cardiac patients to lower their cholesterol.

Rapid measurement of blood volume in patients by an automatic device called the Volemetron was demonstrated clinically to provide guidance for transfusion treatments and patient care.

A serum from certain strains of rabbits was used successfully to treat patients with atropine poisoning, which usually occurs among children under four years of age.

Damaged portions of the urinary tract were repaired by the use of small intestine segments.

Men need more food when they live in extreme heat than when they live in moderate temperatures, an experiment showed, upsetting previous theory.

A vaccine against staphylococci was developed.

Sterilized men were made fertile again by an operation involving a hollow splint that allows spermatic fluid to by-pass the formerly sewed spot.

Jet vaccination was successful in Pakistan by means of a hypospray multidose injector by which vaccine is forced through a minute opening under high pressure and penetrates the surface tissue of the skin.

A measles vaccine was developed and was taken to Nigeria for mass testing.

By making teeth momentarily radioactive, scientists studied the structural relationships of tooth components.

A sodium fluoride concentrate, available by prescription, was placed on the market for the dental protection of persons whose water supplies do not contain fluorine.

An unknown factor in peanuts was reported to control bleeding in persons suffering from hemophilia.

A vaccine against trachoma was developed that produced in humans an antibody response equivalent to that produced by natural trachoma infection.

A seaweed compound called alginon, when mixed with water, was successfully substituted for whole blood in transfusions.

A snail, Ehrenbergi Roth, existing in the Negev desert in Israel and along the North African coast, was found to provide enough fluid to stave off death from thirst.

Aspirin was shown to be as effective in treating rheumatic fever as ACTH and cortisone.

A new self-aligning seat cushion was designed to reduce foot swelling, leg numbness and other causes of truck driver fatigue by maintaining muscular movements even though the driver is seated.

Sir Frank Macfarlane Burnet, director of the Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia, and Peter Brian Medawar, University of London zoology professor, were awarded the 1960 Nobel Prize in Medicine for the discovery of acquired immunological tolerance.

PATENTS

One-man Helicopter Like Winged Doughnut

Numbers following items are U. S. patent numbers. Printed copies of patents can be obtained from the U. S. Patent Office at 25 cents each. Order by number, do not send stamps, and address orders to the Commissioner of Patents, Washington 25, D. C.

A one-man helicopter that fastens around the pilot's waist like a winged doughnut. Patent 2,920,841.

A food-irradiating process aimed at lengthening storage life of foods through use of refrigeration and prolonged exposure to low-intensity radiation. Patent 2,920,969.

A method of making colored motion picture film from a black and white original. Patent 2,927,857.

A device by which data are radioed from satellites and space probes to earth, developed in 1943 but kept under security wraps, therefore not patented until this year. Patent 2,931,897.

A ballast-parachute system that increases the operating life of research balloons by keeping them from falling below useful altitudes and by speeding their ascent to such altitudes. Patent 2,931,597.

The use of Dihydroxyacetone, DHA, in artificial tanning formulations. Patent 2,949,403.

An atom bomb simulator complete with mushroom cloud and fake fallout drops, designed for troop training. Patent 2,934,013.

A method for making colorless diamonds blue or blue-green by subjecting them to electron bombardment. Patent 2,945,703.

An airborne prospecting device for finding radioactive mineral ground areas from helicopters or dirigibles. Patent 2,935,614.

An electric switch that uses granules of current-conducting metal in an hourglass arrangement suitable for operation on the moon, Venus or Mars. Patent 2,935,579.

A mechanical sniffer to detect smoke and turn on fire extinguishers in the various cargo holds of a ship. Patent 2,935,135.

An explosive chemical method of cleaning out mined areas in ground warfare. Patent 2,925,038.

Child-proof kitchen stove controls that remain locked in off position until the upper part of an adult's body intercepts a light beam. Patent 2,926,656.

A method of enhancing the flavor of canned, frozen and dehydrated food by using flavor enzymes obtained from bruised fruit and other food wastes. Patent 2,924,521.

A jet engine with reversible thrust, designed to allow jet aircraft to land in a smaller space. Patent 2,944,394.

A meat-building animal feed that contains small amounts of gibberellin. Patent 2,943,938.

An underwater camera housing that may be adapted to fit almost any 35mm camera. Patent 2,044,474.

Tobaccoless cigarettes made of specially treated, non-acrid cornsilk and alfalfa. Patent 2,943,958.

An automatic umpire for baseball games, consisting of batteries of strategically placed television cameras and image-freezing devices that allow repeated re-running of a particular play shown on the monitor screens. Patent 2,943,141.

A submarine noise damping system designed to gather noise and channel it to the ship's stern where it is smothered in glass fiber batting. Patent 2,942,681.

A safe, radioactive battery in which the energy of charged particles emitted by a radioactive isotope is converted into heat energy and then into electricity. Patent 2,913,510.

A floatable breakwater barrier for calming rough waters during ship loading and oil drilling. Patent 2,928,250.

An attack boat that can travel over water at speeds above 55 knots, fire torpedoes, submerge and rest on the ocean bottom by means of extendible legs. Patent 2,918,029.

A commercially feasible method of purifying dirty crank case oil for reuse. Patent 2,922,758.

A system for facilitating the passage of migratory fish over natural and man-made obstructions in rivers. Patent 2,922,282.

An amphibious vehicle, designed to do the

ANCIENT BONES—Dr. Ralph Solecki (in foreground) of Columbia University and Dr. T. Dale Stewart (in checkered shirt) of Smithsonian Institution, at right Jacques Bordaz, Columbia University graduate student, and a representative of the Iraqi government are examining the skeleton of Shanidar IV, one of seven Neanderthal specimens found in Shanidar Cave in Iraq.

front-line military work of carrying weapons and digging trenches, that can skim over the water or walk over rough terrain and soft ground by means of 12 telescoping legs equipped with feet lined with gripping lugs. Patent 2,918,738.

An airplane crash-site location apparatus, consisting of an inflatable balloon, a cable with shiny aluminum ribbons, a radio transmitter and a smudge pot, all of which would be released automatically by the impact of crash. Patent 2,923,917.

A nail containing sealed-in termite poison that is not released until the nail is driven well into the wood. Patent 2,923,039.

A four-chambered filter that attaches to an automobile exhaust pipe and uses castor oil to reduce noxious fumes. Patent 2,932,157.

A missile launcher that fires rockets or missiles rearward, rather than forward, from a flying plane. Patent 2,932,238.

A decoy torpedo equipped with electric motor, phonograph and amplifier, and a loudspeaker designed to simulate the noises of a submarine and lure away attacking ships while the real submarine escapes. Patent 2,938,483.

A stereoscopic television system that the viewer straps to his head. Patent 2,955,156.

A means of holding corrective lenses in gas masks. Patent 2,951,418.

A method of forming a strong metallurgical bond between aluminum and radioactive thorium. Patent 2,914,847.

A jet-propulsion system that utilizes the violent and spontaneous reactions of certain chemicals with water. Patent 2,914,913.

A card of papers chemically treated to change color in the sun, for warning sunbathers of impending burn. Patent 2,949,880.

PSYCHIATRY AND PSYCHOLOGY

Brain Waves Picked Up From Single Nerve Cells

Electrical signals (brain waves) were picked up from single nerve cells in the brain, and the effects of sleep and waking on this activity was studied.

One monkey is able to communicate useful information to another monkey, and thus enable the partner to earn a reward for both, it was found experimentally.

Brain surgery of the type called topectomy was found to result in a loss of ability to understand words, the loss showing up ten years after the operation.

By "listening in" on the nerve in the tongues of animals and in the brain centers governing taste, an electrical measure of the strength of taste sensation was obtained.

Use of the drug LSD-25 (lysergic acid diethylamide) made it possible to "reach" mental patients otherwise unresponsive to psychotherapy, 88 out of 110 showing "slight" to "outstanding" improvement.

Electrical stimulation of parts of the brain during surgical operation showed that the part of the brain in which a memory is stored depends upon which one of the senses was used most in the original experience.

Experiments with cats and rats gave rise to the hope that the familiar drug sodium amytal may some day be used to help soldiers advance in battle in spite of the intense fear ordinarily experienced in combat.

A built-in "sonar" was found to enable a porpoise to go to, catch and eat available fishes and never try to reach other fishes behind a glass barrier; the animal emits trains of sound pulses later picked up by him after reflection from fishes or other objects in the water.

A teaching machine consisting of a specially programmed tape recording made it possible in 20 days to teach a 450-word miniature of the Russian language to soldiers, even those whose lack of aptitude would make it impossible for them to learn Russian by conventional methods.

An extra chromosome was found among the six largest chromosomes in a mentally retarded 21-year-old woman with minor congenital abnormalities.

Russian and U. S. scientists, under the joint auspices of the USSR Academy of Medical Sciences and the New York Academy of Sciences, reported their researches in honor of the great Russian physiologist Ivan Pavlov.

Nearly one American in four has at some time had a problem for which professional help would have been useful and one in five has felt that he was going to have a nervous breakdown, interviews with 2,460 persons showed.

The color-word test, given to 158 individuals from eight to 80, showed a similarity of response between young children and old persons.

Clinical tests on hundreds of patients showed a new drug Deprol to be 76.5% effective in bringing them out of depression without harmful side effects.

The parents of child delinquents were found to show an addiction to the child's delinquency that is very much like drug addiction, unconsciously fostering the child's delinquent behavior, and actually show acute "withdrawal symptoms" when, after psychiatric treatment, the child abandons his delinquent behavior.

A child born as a twin has a greater than usual chance of being mentally defective, a statistical study in England showed.

An economical method for recording and analyzing a patient's non-verbal noises was developed, an adaptation of a method used by acoustical engineers in the study of noise.

Standard psychological questionnaires can be used successfully to predict whether a mental patient will improve and whether he will have to be readmitted to the hospital after discharge, it was found.

A combination of a barbiturate and a slow-acting tranquilizer made it possible for mental patients to get a good night's sleep, it was reported.

It was found experimentally that most otherwise unexplained "flying saucers" are probably "afterimages," a well-known peculiarity of perception.

Human intelligence consists of many facets or abilities, many as yet unidentified, which may eventually be found to number 120 or more, it was reported.

Chemists make their most important as well as their greatest number of discoveries when young—28% of the most important discoveries between the ages of 25 and 35.

Individuals work together better in a small group if they have quite different personalities.

A psychiatrist tried successfully to help unhappy marriages by treating both husband and wife; each individual, it was found, suffered from emotional disturbances dating from childhood; the disturbances helped disrupt the marriages while the bad marriage situations also contributed to the individual breakdown.

Too much "peace and quiet" were found to be the worst possible treatment for elderly persons because sounds serve as a bridge to reality.

Statistics reported in 1960 showed that the number of resident patients in the nation's public mental hospitals dropped during 1959 for the fourth consecutive year.

The aging person who retires suddenly is like the deep-sea diver who surfaces too rapidly; he suffers from a kind of psychological "bends" due to reducing the pressure too fast, it was reported.

"Adult primers" were developed as remedial reading aids for children, adolescents and young adults with reading problems, using gradually expanding vocabulary to develop adult story lines with exciting, adventurous material.

One-second bursts of loud noise, such as come from the firing of rockets, were found to cause a temporary decrease in the efficiency of men making rapid simple decisions.

An inborn need of human infants for companionship was found to be more important for survival than the need for food and warmth.

SPACE

Discoverer XIII Capsule Recovered From Orbit

The first object, a Discoverer XIII space capsule, was recovered from orbit; its insulation was found to be sufficient to protect a small animal in it from the heat of re-entry.

The capsule of Discoverer XIV satellite was the first object recovered in mid-air from an earth-circling orbit.

For the second time in history, a satellite capsule was caught in mid-air when the 300-pound capsule from Discoverer XVII was recovered 9,000 feet above the Pacific after the capsule had traveled almost a million miles in two days of space flight.

During the useful lifetime of TIROS I, the 270-pound satellite orbiting 400 miles above the earth, more than 20,000 cloud pictures were taken by the satellite's two cameras, revealing cloud systems ranging in size from cyclonic, spiral vortices several thousand miles in extent to cloud structures a few miles across.

TIROS II, orbiting from 406 to 431 miles above the earth, contained infrared instruments to measure the temperature of the earth's atmosphere, and orientation equipment to keep the satellite in the optimum observing position.

A communications satellite, Courier, that received and sent news at the speed of 68,000 words per minute over 20 teletype channels, was was placed in orbit.

Rockets sent to the moon should be biologically clean because microbes carried to the moon would destroy sources of information on the origin of life and the history of the solar system, it was urged.

Echo I used the maser, a new form of microwave amplifier, to receive and amplify radio signals.

Pioneer V went into its orbit around the sun with near perfect performance of rocket engines and guidance systems.

Explorer VII, launched in 1959, continued in 1960 to transmit radiation data needed to determine the heat budget of the atmosphere, and showed that high clouds produced an important variation in the radiation measurements.

The balloon satellite Echo developed wrinkles in its thin shell but was still performing after several months in orbit.

Highly permeable magnetic metals could be used as rudders on space ships to control the direction of flight by interaction with the earth's magnetic field, studies of Vanguard II's orbital rotation showed.

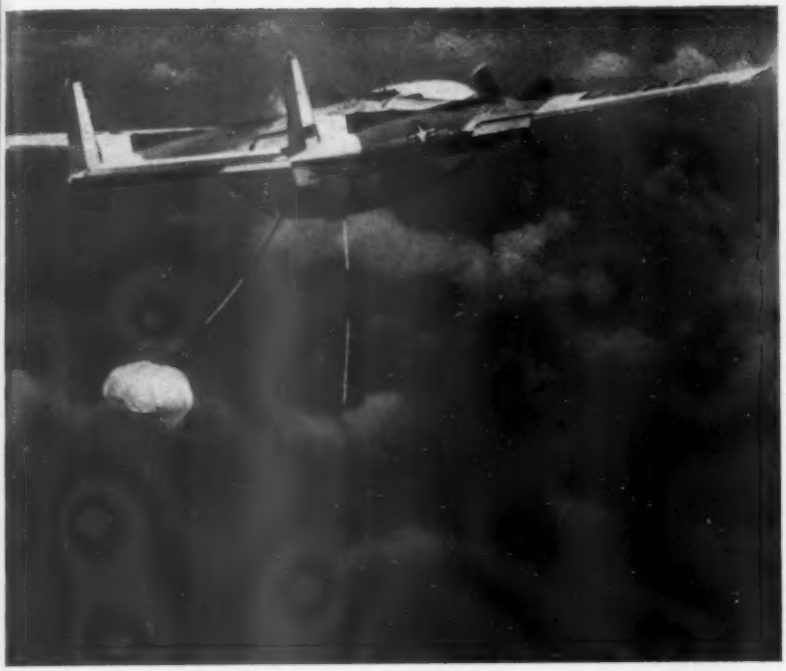
Solar radiation pressure was found to account for the discrepancies between calculated and observed heights of Vanguard I.

The Transit I-B satellite sent data back to earth that assured scientists a foolproof navigation system for ships and planes can be built, using radio satellites, and also measured cosmic noise level.

Explorer VIII, placed in a highly elliptical orbit, was designed to produce the maximum information concerning the Van Allen radiation belts with the minimum weight demands.

Three mice flew 5,000 miles in an Atlas missile in the first flight with living creatures in a U. S. Intercontinental ballistic missile.

Important national security programs are held



RECOVERY FROM SPACE—For the first time, a space capsule was recovered in mid-air when the capsule of Discoverer XIV was snagged by an Air Force crew high over the Pacific.

up by a lag in development of new metals, ceramics and plastics, the National Academy of Sciences reported.

The acceleration of satellites around the earth undergoes four distinct kinds of changes, one of which follows the rhythm of the sun's radiation as recorded at 2,800 megacycles.

A rocket shot 80 miles high carried a monkey, barley, rat nerve cells, neurospora, cultures of bacteria and cell tissues, and flour beetle eggs to study the effect of radiation and weightlessness.

It was found that careful selection of launching conditions allows the influence of the sun and the moon to lengthen the life of satellites with apogee heights of about 28,000 miles and perigee heights of about 4,000 miles.

An airplane-launched ballistic missile made a short trip alongside the paddlewheel satellite, Explorer VI.

A experimental ion engine capable of developing speeds of 100,000 miles an hour was under construction.

A fluid-filled sac, like those in which unborn babies develop, was suggested as an ideal space capsule in combination with cooling to the point of suspended animation.

The Polaris system, submarine-launched missiles with a range of 1,500 miles, became operational this year at a cost of $2,742,648,000 appropriated since the system was proposed in 1954.

A milk-bottle-sized rocket designed to maneuver satellites about in space proved successful in simulated space tests.

A nylon-net space suit, designed to hang suspended like a hammock in seatless cockpits of future space ships, was developed to keep astronauts from floating about on gravity-free flights.

A ceramic gyroscope, operating like a child's top, promised to increase the accuracy of U.S. missiles.

Year-long series of tests on rocket engine cases made of aluminum showed that aluminum is stronger than the same weight of steel.

It was calculated that only about 15 pounds of helium gas would be required to form a blanket about a space ship to protect it from overheating on a 4,000-mile flight at an altitude of 20 to 30 miles.

Lunik III, the Russian satellite that photographed the moon's far side, fell back into the earth's atmosphere in March.

Pyrographite, a high purity form of graphite able to withstand temperatures up to 6,700 degrees Fahrenheit, higher than any other known element, was developed as a possible solution to some of the problems in missile construction.

The explosion of aluminum wire by high voltage electrical discharges was found to be promising for powering space rockets.

A helicopter-like system was designed to bring a rocket engine back to earth for re-use.

Gold film, four-millionths of an inch thick, was found unequaled as a reflector of heat radiation when used on missile and aircraft sections.

Data from Explorer VII and Pioneer V showed that the earth is surrounded by a ring current, 24,000 miles in diameter, containing particles that affect the earth's magnetic field.

Messages could, in an emergency, be relayed by rocket 300 miles up as far as 1,400 miles along the earth's curvature, a rocket study showed.

Daphnia, or "water fleas," a soft-shelled crustacean, could be used as food for man in space, it was found.

Astronauts could glide back to earth on a flexible "paraglider," a combination of parachute and glider, studies showed.

Pop-up balloons were developed to stabilize and slow down nose cones and manned capsules as they re-enter the upper atmosphere.

Accurate space navigation was foreseen through use of the cryogenic gyroscope that operates near absolute zero.

• Books of the Week •

For the editorial information of our readers, books received for review are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C.

ANTARCTIC WORLD—John Euller—*Abelard-Schuman*, 222 p., illus., $3.75. Historically reviews man's interest in exploring the icy world of the Antarctic.

THE ASTRONAUTS: The Story of Project Mercury, America's Man-in-Space Program—Martin Caidin—*Dutton*, 192 p., photographs, illus. by Fred L. Wolff, $3.95. Describes in detail the training program of the astronauts, for the general reader.

BALLOONS: From Paper Bags to Skyhooks—Peter Burchard—*Macmillan*, 48 p., illus. by author, photographs, $3.75. History of balloon making, for children.

BETTER COLOR SLIDES OUTDOORS—Fred Bond—*Ziff-Davis*, 104 p., illus., paper, $1.95. Guide for beginner as well as the advanced amateur.

THE BOOK OF THE ATOM—Leonard de Vries, transl. from Dutch by Eric G. Breeze—*Macmillan*, 267 p., illus. by G. Van Straaten, $3.95. From alchemy to the cosmotron, tells the story of man's search and discoveries.

CONGENITAL MALFORMATIONS OF THE HEART, Vol. I: General Considerations—Helen B .Taussig—*Harvard Univ. Press*, 2nd ed., 204 p., illus., $4.75. Expanded edition of book based mainly on author's clinical studies of patients with proven congenital heart defects.

DARWIN AND BUTLER: Two Versions of Evolution—Basil Willey—*Harcourt*, 116 p., $3.50. The Hibbert Lectures 1959, treating Darwinism as an influence affecting the thoughts and feelings of the last century, and indirectly of our own time.

DYNAMICS OF RIGID BODIES—William Duncan Macmillan—*Dover*, 478 p., paper, $2. Reprint of 1936 edition.

EXPLORING THE RIVER—John and Jane Greverus Perry—*Whittlesey House*, 203 p., illus. by Stephen Kraft, $3.50. Invites young people to find out about the forces and forms of nature along a 450-miles-long river, from source to sea.

HOW TO ENRICH YOUR SCIENCE STUDIES: A Guide for Students in Junior and Senior High Schools—Bernard Udane and Herman W. Gillary—*Ungar*, 270 p., illus., $3. Full of suggestions for student, teacher and parent on how to broaden and intensify young people's interest in science.

INTERNATIONAL REVIEW OF CYTOLOGY, Vol. IX—G. H. Bourne and J. F. Danielli, Eds.—*Academic*, 424 p., illus., $13. Reports on recent research findings.

AN INTRODUCTORY TREATISE ON DYNAMICAL ASTRONOMY—H. C. Plummer—*Dover*, 343 p., paper, $2.35. Unabridged reprint of original 1918 edition.

MEMORY-FOR-DESIGN TEST: Revised General Manual—Frances K. Graham and Barbara S. Kendall—*Perceptual and Motor Skills*, Monograph Supplement 2-VII, 40 p., illus., paper, $2.50. Describes method and results of test given to groups with brain disorders.

THE NATURE OF ANIMAL COLOURS—H. Munro Fox and Gwynne Vevers—*Macmillan*, 246 p., color photographs, $6.50. Written for zoologists, treats comprehensively animal pigments from physical, chemical and physiological viewpoints.

NEMATOLOGY: Fundamentals and Recent Advances with Emphasis on Plant Parasitic and Soil Forms—J. N. Sasser and W. R. Jenkins, Eds.—*Univ of N. C. Press*, 480 p., illus., $12.50. Series of lectures by authorities presented at Southern Regional Graduate Summer Session in Nematology in 1959.

THE NEW AGE IN PHYSICS—Sir Harrie Massey—*Harper*, 342 p., illus., $5. Physicist reviews the extraordinary advances in physics, in our knowledge about electrons, relativistic quantum theory, exploration and exploitation of the atomic nucleus, strange particles, radio astronomy and exploration of space.

NEW WORLD THROUGH THE MICROSCOPE—Robert Disraeli—*Viking*, rev. ed., 175 p., photomicrographs by author, $4. Designed to arouse young student's interest in the invisible world around him.

OUR LIVING SOIL—J. Gordon Cook—*Dial Press*, 190 p., $3. Explains for the general reader the chemistry of the soil and plant physiology.

OUR OBSTETRIC HERITAGE: The Story of Safe Childbirth—Herbert Thoms—*Shoe String Press*, 164 p., illus., $4.75. Compact history of the development of modern obstetrics, written by obstetrician and historian.

QUANTITATIVE ANALYSIS—Ray U. Brumblay—*Barnes & Noble*, 235 p., illus., paper, $1.50. In outline form presents principles, procedures, examples, problems and answers.

THE QUARTERLY JOURNAL OF THE ROYAL ASTRONOMICAL SOCIETY, Vol. I, No. 1—M. Bondi and M. W. Ovenden, Eds.—*Royal Astronomical Society*, 128 p., illus., paper, $1.80; quarterly, $6 annually. Contains articles on the origin of the solar nebula, and on the surfaces of stars, written for the non-specialist.

THE ROMANCE OF WEIGHTS AND MEASURES—Keith Gordon Irwin—*Viking*, 144 p., illus. by Johannes Troyer, $3.50. Tells of systems of measurement in early England, Egypt, Greece, Rome and Germany.

SCIENCE PUZZLERS—Martin Gardner—*Viking*, 128 p., illus. by Anthony Ravielli, $2. Scientific recreations with explanations.

THE SCIENTIST IN AMERICAN INDUSTRY: Some Organizational Determinants in Manpower Utilization—Simon Marcson—*Industrial Relations Section, Princeton Univ.*, 158 p., paper, $3. Discusses career development of scientist, his professional needs, and team work in research.

SOURCEBOOK IN PSYCHOLOGY: A Course of Selected Reading by Authorities—Edwin G. Boring and others; introd. by James Drever—*Philosophical Lib.*, 335 p., $6. Biographical notes included.

• Science News Letter, 78:414 December 17, 1960

Do You Know

Only a few mammals, including man and apes, see objects in *color*.

Over 75% of families in England have *television* sets.

A record crop of *honey* was produced this year—nearly 253,500,000 pounds by the nation's 5,500,000 colonies of bees.

Hypersonic *speed* is five times or more the speed of sound.

About 40% of Norway's *orange* consumption is covered by oranges imported from Jaffa, Israel.

• Science News Letter, 78:414 December 17, 1960

GENERAL SCIENCE

Panel on Science Youth

► WAYS OF PROVIDING challenging opportunities for America's potential scientists will be explored at the annual meeting of the American Association for the Advancement of Science when it convenes in New York, Dec. 26-31, 1960.

The conference on science youth activities will discuss the stimulation of student research projects and special opportunities for the gifted science student, including such programs as science fairs, science clubs and the Science Talent Search for the Westinghouse Science Scholarships and Awards. The conference will be conducted on Friday afternoon, Dec. 30, by SCIENCE SERVICE which administers Science Clubs of America, the National Science Fair-International and the Science Talent Search.

Discussion leaders will be Dr. Morris Meister, president of Bronx Community College, N. Y., and former principal of Bronx High School of Science; Dr. Wayne Taylor, professor of teacher training courses in science and mathematics at Michigan State University and active for many years as a state Science Talent Search director and in science fair and Junior Academy of Science programs; and Dr. Burrell Wood, now a SCIENCE SERVICE staff member and a former college chemistry professor, science fair director and state Science Talent Search director.

The chairman of the conference will be Gordon Fister, associate editor of the Call-Chronicle Newspapers in Allentown, Pa., and director of the Lehigh Valley Science Fair. Dr. Watson Davis, director of SCIENCE SERVICE, will open the meeting.

Science teachers, sponsors of science clubs, science fair committee members and Science Talent Search cooperators are especially invited to attend this session of the AAAS meeting and to participate in the discussion.

• Science News Letter, 78:415 December 17, 1960

PHYSICS

AEC Trains Latin America

► LATIN AMERICA is being encouraged to give advanced education in atomic development for peaceful uses through courses at the U. S. Atomic Energy Commission's Puerto Rico Nuclear Center at Mayaguez.

Specialists from 18 Latin American countries have been taking graduate-level courses in nuclear science and technology being taught in the Center in the Spanish language, it was reported at the AEC's first seminar in Germantown, Md., for discussion of ways to increase the Center's effectiveness in this part of the world.

Dr. John C. Bugher, the Center's director, formerly with the Rockefeller Foundation, urged increased private and public support for student maintenance. The facilities and teaching materials, still under construction, are part of a $3,500,000 building program designed to make the latest in training and research available to students from all the American nations.

The heart of the Center is the ten-watt water-boiler type reactor built by Atomics International, a division of North American Aviation. A larger pool-type reactor will be completed next year and will greatly increase the research and teaching services of the Center.

This will bring the number of U. S. AEC operating reactors in Latin America to four. Venezuela and Brazil each have an AEC reactor. This is two-thirds the number of such operating reactors in the world, although the AEC currently has 14 more under construction in Europe, Asia and Africa.

Virtually every country in Latin America, including Cuba, has had visits from U. S. atomic specialists.

Fourteen libraries, supplied by the AEC, with approximately a total of 25,000 pieces of literature on atomic energy, serve Latin America.

Atomic fuel for medical use and research also has been made available to these countries and others in the world by the AEC through the International Atomic Energy Commission.

Through these aids, the AEC hopes to develop skilled and trained personnel in all areas of nuclear science and technology, particularly in the area of radiobiological health which becomes more vital as atomic development grows throughout the world.

• Science News Letter, 78:415 December 17, 1960

Questions

ASTRONAUTICS—What does 8-g's mean? p. 403.

GENERAL SCIENCE—What is the process of basic research? p. 405.

PUBLIC SAFETY—At what height are living organisms killed? p. 402.

Photographs: Cover, Los Alamos Scientific Laboratory; p. 402, General Electric Company; p. 403, National Aeronautics and Space Administration; p. 405, Fremont Davis; p. 407, Hughes Aircraft Co.; p. 411, Columbia University; p. 413, U. S. Air Force; p. 416, Eastman Chemical Products, Inc.

New Machines and Gadgets

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE NEWS LETTER, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 1070. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

THREE-MANUAL ORGAN, only 29 inches in depth, in do-it-yourself kit form can be built for home use by following step-by-step instructions. The organ contains 64 stops and couplers, 61-note manuals and 32-note pedal board, and has a full, rich concert-quality tone.

• Science News Letter, 78:416 December 17, 1960

EMERGENCY FLASHER LIGHT has a suction cup that sticks tight to any smooth metallic surface. It has more than 100 safety uses—for autos, trailers, bikes, boats, etc. Powered by two flashlight batteries, a brilliant red light (flasher bulb) blinks a constant signal visible for 500 feet.

• Science News Letter, 78:416 December 17, 1960

COOK AND SERVE TOOLS in a Lazy Susan holder can be used on kitchen counter-top, in the cabinet or on the dining table. The decorated handles of molded plastic stand up through washing in automatic dishwasher.

• Science News Letter, 78:416 December 17, 1960

OUTDOOR CHRISTMAS DECORATIONS of weather-resistant butyrate plastic add luster to displays during the day and provide light at night. Modern, multi-faceted globes, old-fashioned lanterns and bells and a humorous, double-faced gnome with a red lamp for a nose provide a choice of styles. The finishes of the lightweight, three-

dimensional decorations, shown in the photograph, will not chip or wear off.

• Science News Letter, 78:416 December 17, 1960

SURGICAL ADHESIVE TAPE has unusual sticking ability but can be removed painlessly, even from hair. The non-irritating tape is available to the medical profession through surgical supply houses and wholesale druggists but is not yet on sale to the general public.

• Science News Letter, 78:416 December 17, 1960

GOLD COAST GAME is a modern version of a game, called mancala, played in Africa for more than 3,000 years. The gameboard is of ebony plastic with gold-lined playing cups; there are 25 ruby and 25 white glass playing pieces. A game for two persons, it is said to be more fascinating than chess, more spirited than checkers.

• Science News Letter, 78:416 December 17, 1960

MULTI-PITCH PROPELLER for outboard motors can be used in fresh or salt water. With it, the best pitch or blade angle for any load or boating activity can be dialed. It can be set low for power, for skiing and heavy loads, high for speed and economy, and extremely low for slow trolling.

• Science News Letter, 78:416 December 17, 1960

CLOSET DOOR SHELVES to occupy space usually wasted may be built by any do-it-yourself handy-man or carpenter by following a set of simple, fully detailed plans. Plans for each unit on an average-sized closet door provide 22 lineal feet or more of shelves and come complete with material list, tool list and drawings.

• Science News Letter, 78:416 December 17, 1960

Nature Ramblings

➤ FOR THE FIRST TIME in United States history, there will be an open season on lesser sandhill cranes.

Shooting will be confined to the month of January (1961) and to the eastern tier of counties in New Mexico. Any hunter who ventures into the western part of the state may be in real trouble, for this is the home of the lesser sandhill's big brother, the greater sandhill crane—an illegal target.

The difference between *Grus canadensis canadensis*, the lesser crane, and *Grus canadensis tabida*, the greater crane, are so slight that even professional ornithologists are hard pressed to distinguish the two. Both are big gray birds with bare, rusty foreheads and black beaks and legs. Both have the same loud, defiant voice.

The main difference in the appearance of these two subspecies or races is their size. The greater crane averages about three and one-half feet tall and the lesser crane is about six inches shorter.

Dr. John W. Aldrich of the U. S. Department of Interior said the open season was prompted by farmers plagued by the sandhills' pilfering of grains along their migration routes.

Open Season

The greater sandhill cranes migrate through Washington and Oregon to western New Mexico, California and Arizona, and from Michigan to Florida. They number only 2,700.

The lesser cranes start their southward trek from two far-flung points, Siberia and Canada's Baffin Island. They pass through the wheat areas during harvest time, take their fill, and meet on the Platte River in Nebraska for the noisiest conference of the year. Then, 150,000 to 250,000 strong, they journey on to eastern New Mexico, western Texas and Mexico, gorging themselves on shocks of sorghum.

The situation has become so serious that Canadian and United States officials conferred and decided a season must be opened either in this country or in Canada. The whooping crane, the biggest and rarest bird of all, spends its summers in Canada and would be in danger if shooting were allowed there.

—GLORIA BALL

• Science News Letter, 78:416 December 17, 1960